DOCUMENT RESUME

ED 095 834 IR 001 008

AUTHOR Mitroff, Ian I.; And Others
TITLE On Management "Myth"-Information Systems.
PUB DATE 74
NOTE 25p.

EDRS PRICE MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS Decision Making; Game Theory; *Information Systems; Management Games; *Management Information Systems; Management Systems; *Mythology; Story Telling
IDENTIFIERS FREUD; Management Myth Information Systems

ABSTRACT

Management Myth-Information Systems (MMIS) are information systems which present information to a decision maker by means of stories. In MMIS a scientific datum by itself is not information, but is information if and only if it is tied to an appropriate story or myth that has meaning to the individual who needs the information, the organization in which he is located, and the type of problem that he faces. Since this defines the key variables underlying MMIS, the study of the critical literature dealing with the nature and function of mythology becomes central to MMIS design. Ways are suggested in which the literature of mythology and the phenomenon of story-telling can be used in the design of MMIS if not for information systems in general. An experiment dealing with some central features of MMIS involved playing a series of games under the twin conditions of uncertainty and dialectical advice. Experimental subjects were exposed to the advice of two radically opposing "experts of the game" who were designed to present opposing views of the game situation. A suggested program of research and a list of references are given. (Author/LS)

A-1

On Management Myth-Information Systems

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

by

Ian I. Mitroff

Graduate School of Business;
Interdisciplinary Doctoral Program
in Information Science;
Philosophy of Science Center
University of Pittsburgh 15260

and

John Nelson

Interdisciplinary Doctoral Program
in Information Science;
University of Pittsburgh 15260

and

Richard O. Mason

Graduate School of Management
UCLA
Los Angeles, California

Abstract:

This paper describes some key defining characteristics of a special class of information systems known as Management Myth-Information Systems (MMIS) or story-telling information systems. MMIS are information systems [26] which present information to a decision maker by means of stories. In a MMIS, a scientific datum by itself is not information. In a MMIS, information is information if and only if it is tied to an appropriate story or myth that has meaning to the individual who needs the information, the organization in which he is located, and the type of problem that he faces. This defines the key variables underlying a MMIS. As such, the study of the critical literature dealing with the nature and function of mythology becomes central to the design of MMIS. One of the key purposes of this paper is to suggest how the literature of mythology and the phenomenon of story-telling can be used in the design of MMIS if not for information systems in general.

An experiment dealing with some central features of MMIS is described. The experiment involved playing a series of games under the twin conditions of (1) uncertainty and (2) dialectical advice. Experimental subjects were exposed to the advice of two radically opposing "experts of the game" who were designed to present two radically opposing views ("stories") of the game situation. Finally, a program of research on MMIS is proposed.

Acknowledgement

The authors wish to acknowledge the helpful comments of Professors C. West Churchman, Henry Mintzberg, David Rutenberg, and Martin Starr. Any errors of interpretation which remain are those of the authors.

"The Hegelian inquirer is a storyteller, and Hegel's thesis is that the best inquiry is the inquiry that produces stories. The underlying life of a story is its drama, not its 'accuracy.' Drama has the logical characteristics of a flow of events in which each subsequent event partially contradicts what went before; there is nothing duller than a thoroughly consistent story. Drama is the interplay of the tragic and the comic; its blood is conviction, and its blood pressure is antagonism, It prohibits sterile classification. It is above all implicit; it uses the explicit only to emphasize the implicit.

But is storytelling science? Does a system designed to tell stories well also produce knowledge? Or can such a system be 'designed'? Or is the storyteller ever a 'system'? [10 , p. 178]."

C. West Churchman

Introduction

The basic objectives of this paper are: (1) to call attention to a significant problem that has been virtually ignored in the Management Information Systems (MIS) literature and which in our opinion is richly deserving of major research efforts, and thus (2), to attempt to lay the foundation for the scientific study of a radically different kind of information system from those currently in vogue. The generic label for these systems is Management Myth-Information Systems (MMIS). Briefly, MMIS are information systems [26] which present information to a decision-maker by means of stories. In a MMIS, a scientific datum or an item of information in the usual technical sense of information is not information by itself [2, 26]. In a MMIS, data becomes information if and only if it is tied to an appropriate story that has personal meaning to the individual who needs the information, the organization in which he is located, and the

type of problem that he faces. In a previous paper, two of the authors have proposed the following definition of an information system: "an information system consists of at least one PERSON of a certain PSYCHOLOGICAL TYPE who faces a PROBLEM within some ORGANIZATIONAL CONTEXT for which he needs EVIDENCE to arrive at a solution (i.e., to select some course of action) and that the evidence is made available to him through some MODE OF PRESENTATION [22, p. 475]." A MMIS is thus a particular subset of the general class of information systems. The key defining variable is that of the mode of presentation. In a MMIS the dominant mode of presentation is personalistic [22, p. 476]. A MMIS is designed to present information to a decision-maker in terms of an appropriate story that takes account of his or her psychological type (i.e., the fact that not all individuals have an inherent liking for the same kinds of stories), the kind of problem the individual faces, the organization in which the individual is located, and finally, the nature of the evidence which is either available or which is needed to solve the problem that presents itself.

Many biographies and autobiographies attest to the power that stories play within modern large-scale organizations. These autobiographies retell in a form strikingly similar to the great epic myths of the past [36] the life of the organization and that of the individual within it. They describe in heroic terms more dramatic than life itself, the difficult circumstances under which the organization was born, the tremendous struggle that had to be overcome to keep the organization alive in the early perilous years of its existence, how those involved made great personal sacrifices born out of intense dedication to the organization, how the organization

began slowly to grow, and finally how in later years, the organization achieved a success far greater than one ever dared to dream. The story becomes the corporate myth and is the transcript which establishes and perpetuates corporate traditions. It is recounted at formal occasions and at coffee break "bull sessions" and is used to indoctrinate new employees. The corporate myth is the "spirit" of the organization and is infused into all levels of policy and decision making. Most important of all, these biographical and autobiographical sketches give credence to the notion that an organization's factual data, no matter how precise or accurate they may be, are not information unless they are integrated into one or more of the key motifs which define the symbolic nature of the organization.[1]

The Study of Mythology As The Underlying Theoretical Basis of MMIS

It is beyond the scope and purpose of this paper to review in any great detail the literature that constitutes the underlying theoretical basis for the design and rationale of MMIS. Of necessity our discussion must consist mainly in pointing out some relevant literature.

Without question the body of literature which is most directly relevant for the design and rationale of MMIS is that which deals with the nature of mythology, particularly with its critical analysis. In recent years a critical literature has been amassed which shows that instead of being an aimless, unsystematic, or unanalyzable phenomenon, the myths of

---

[1] For an elaboration on this theory of information as distinct from "data" see Churchman [10, pp. 159-170].

the most diverse cultures exhibit a remarkable similarity of substance and form [6, 7, 8, 17, 23, 28, 34, 36, 38]. That is, there are not only strong similarities between the general themes that are portrayed in the myths of the most diverse cultures but there are also strong similarities between the detailed narrative forms that these myths assume as well. Joseph Campbell, one of the most important analysts of the comparative structure of myths, puts it as follows:

> The comparative study of the mythologies of the world compels us to view the cultural history of mankind as a unit; for we find that such themes as the Fire-Theft, Deluge, Land of the Dead, Virgin Birth, and Resurrected Hero have a world-wide distribution, appearing everywhere in new combinations, while remaining, like the elements of a kaleidoscope, only a few and always the same...No human society has yet been found in which such mythological motifs have not been rehearsed in liturgies; interpreted by seers, poets, theologians, or philosophers; presented in art; magnified in song; and ecstatically experienced in life-empowering visions [8, p. 232].

It is not our purpose here to examine these universal cultural motifs in detail, nor to demonstrate that the kinds of stories that play such an important role in the life of the modern organization could also be shown to break down into a relatively few thematic categories. Rather, our main purpose is to call to the attention of management scientists the fact that there currently exist definite analytical systems which permit the detailed analysis of the structure of myths or stories. Indeed, one of the most important analysts in the field goes so far as to develop an explicit twenty-two point scoring system [38] in terms of which one can score the thematic content of "the myth of the hero" as it varies from culture to culture! In short our contention is that there exists a definite form and order to the structure of stories such that one who is familiar with this theoretical structure can use it in the design of MMIS.

An Experiment With MMIS

In order to further our thinking with regard to the idea and the development of MMIS, a series of experiments were undertaken to see if we could, first of all, design an information system which made use of some key MMIS design concepts and, second, if we could test the effectiveness of the MMIS as a way of presenting information to decision makers of varying psychological make-up. The fundamental concept around which all of the experiments were patterned is that of Dialectical Inquiring Systems (DIS).[2] There is in fact a great deal of overlap between the purposes and properties of DIS and MMIS.

The authors have discussed elsewhere the properties of DIS in a number of previous papers [25, 26, 30, 31, 32, 33]. It is necessary therefore to review here only those features which are most pertinent for the present discussion. The essence of DIS is conflict [10]. For any issue, DIS are designed to present the strongest possible debate on that issue between at least two of the strongest opposing views or positions of that issue. The concept of DIS rests on the basic assumption that a decision maker will be better able to formulate a richer policy decision as the result of witnessing an intense debate between opposing policy positions or experts than by witnessing agreement between them. The notion of stories and the idea of drama are central to DIS because they are not only constructed to present the most compelling logical or cognitive case for each position but they are also constructed to present the most psychologically compelling, dramatic, or affective case for each position. In effect, each side of a DIS does everything in its power to convince the decision maker that its view (or story)

---

[2] For a detailed description of the design, analysis, and results of these experiments, see [37].

of the world and its view alone is the correct one. It is hoped that as a result of witnessing this intense confrontation between strongly conflicting stories, the decision maker will be led to form a new story of his own about the world that is a creative synthesis of the best of the original stories.

Because the ability to think in a dialectical mode is not widespread in our culture [4] and because the authors believe that the fundamental policy issues of our society require the strongest possible examination from the strongest opposing points of view [25, 33], we have concentrated our initial experiments on determining whether or not subjects can be trained to think in a dialectical mode or at the least to develop a greater appreciation for the examination of issues from a dialectical point of view. The first series of experiments consists of an exercise or game called BEAT THE COMPUTER which is designed to illustrate the nature of dialectical thinking and to give the subject explicit training in the method. The second series consists of an exercise called FREUD which is designed first to probe the subject's attitudes toward dialectical thinking and second to induce him or her to think dialectically. Since the primary purpose of this paper is to indicate the nature of mythic or story-telling "characters" and how one goes about creating them, the description of these experiments is more important than a detailed discussion of experimental results.

BEAT THE COMPUTER involves playing a game under conditions of uncertaint [24, pp. 275-286]. Subjects are introduced to the exercise by being told that they will be shown a series of matrices. They are instructed that for each matrix their task is to pick the row which they believe will give

them the largest payoff. The payoffs are represented by the numbers in the matrices which lie at the intersection of each row with each column. The subjects are told that prior to their picking a row they will not know which column the computer has picked. As soon as they have picked a row, they will then be informed as to which column the computer has picked. The subjects are also informed that they will be shown 10 matrices and that in order for them to win or "beat the computer" they will have to amass 45 points. In addition they are told that the computer will pick columns at random.

Before play begins the subjects are informed that in order to win they will need some sort of plan or strategy. In order to help them form a strategy, they will have the opportunity to listen to "two experienced experts of the game," Smiley and Grumpy. The subjects are also told that both experts disagree strongly in their methods of play and that they stick to their respective strategies no matter what.

All of the game instructions and the dialogue between the opposing experts are programmed on a Datapoint 2200 computer. Everything is displayed on a console screen for the subjects' viewing. This was done for the express purpose of bringing the opposing experts or characters to life. We explicitly wanted the subjects to feel that they were witnessing an actual debate between two very real characters. From every behavioral measure we have used (ranging from written attitudinal instrument responses to verbal subject protocals collected during plays of the game), there is an overwhelming indication that the subjects perceive the characters as "real". From the comments of the subjects, it is clear that they form definite impressions of the characters and react to them as they would to actual persons. The following is an example of some of the introductory dialogue that actually takes place between the two experts:

"Hello, and how are you? My name's Smiley O'Sullivan. Let me show you how to win this game. And listen, don't pay any attention to that dumb computer--my way is the absolute best! All you have to do is choose the row which contains the LARGEST number in the matrix. If the LARGEST number occurs in more than one row, add up the three numbers in each competing row, and pick the row with the greatest total score. Look!

	COL 1	COL 2	COL 3
ROW 1	6	4	3
ROW 2	4	5	2
ROW 3	8	2	2
ROW 4	3	8	0

Using my method, you see that 8 is the LARGEST score in the matrix. But since it occurs in both ROW 3 and ROW 4, you must pick the row with the highest overall total. ROW 3. Stick with me and you'll make out best every time!"

"Bah! I'm Grumpy Schwartz, and if you listen to that stupid Irishman, you are nuts![3] The only way to win this game is my way! What you do is note the SMALLEST score in each row. Then you pick the row with the LARGEST of this set of SMALLEST scores. If the LARGEST of this set of SMALLEST scores occurs in more than one row, add up the three numbers in each competing row, and pick the row with the LARGEST total score.

	COL 1	COL 2	COL 3	SMALLEST ROW SCORE
ROW 1	6	4	3	3
ROW 2	4	2	5	2
ROW 3	8	2	2	2
ROW 4	5	8	0	0

Obviously, you pick ROW 1 since 3 is the LARGEST of the set of SMALLEST scores."

[At this point, the computer comes in, as it does throughout, with a comment:]

WELL, AS YOU CAN SEE, SMILEY AND GRUMPY ARE PRETTY SURE OF THEMSELVES. LET'S LISTEN IN--THEY'RE STILL ARGUING!

Smiley: "Oh Grumpy! You're such a pessimist! Using your method, one never has a chance to win the highest score in the matrix."

Grumpy: "Oh yeah? Well, smart guy, what happens if the row you pick has a really bad score, like 0, and the computer picks the column with that zero? With my method that never happens--the player never gets stuck with the worst score. Look! With your method I should pick ROW 2. But if the computer picks COL 2, you get hurt!"

	COL 1	COL 2	COL 3
ROW 1	4	2	0
ROW 2	5	0	1
ROW 3	2	3	1
ROW 4	1	3	1

---

[3] Our intent here is not to introduce "irrelevant" or demeaning ethic slurs. The justification for our including such slurs derives from the fact that one of the things we are precisely interested in examining is what effect, if any, strong perjorative and emotional statements exert on the assimilation of information. The notion of strong emotional statements and their effect on decision-making is, to repeat an earlier point, central to the idea of the DIS where both sides are not only cognitively divided but also emotionally or affectively divided; hence both sides are not only motivated to present their side or position in the best possible light but they are also motivated to do everything in their power to tear down their opponents' views. Slander is one of the weapons at the disposal of both sides, and as such, is an important variable in our investigations.

Smiley: "Tsk, tsk. You always expect the worst! What if the computer, in the long run, picks good columns? Then you'll be sorry! I'll make out best!"

Grumpy: "What kind of crazy optimist are you? This damn computer is out to screw the player every time. If you think this computer's going to pick the best columns, you're nuts. I'm telling you, you're going to lose really badly. I'll do best!"

It should be readily apparent by now that Smiley represents a max-max or optimistic game strategy and that Grumpy represents a max-min or pesimistic game strategy [24, pp. 274-286].

The subjects were not only given as much time as they wanted to inspect each matrix prior to their choice of a row, but they were also given some additional information as well. The computer displayed clearly the number of game plays left after the current play. The subject could also see how well he was doing in relation to Smiley and Grumpy since the subject's score to the point of current play was displayed along with those of Smiley and Grumpy. In addition, prior to the subject's choice of a row, Smiley and Grumpy engaged in a small bit of further dialogue. Each of them indicated explicitly which row they were going to choose and why, and each of them tried to persuade the subject to follow his advice to the exclusion of the other. Each expert in effect took the same initial data (the specific game matrix, the subject's score, their (i.e., Smiley and Grumpy's) scores) and interpreted it entirely differently. Each expert processed the "same" data through different versions or stories of the world and reached opposing conclusions. Subjects had to figure out what to do for themselves in the midst of conflicting recommendations.

At this point subjects engaged in play and proceeded through the ten matrices. What the subjects didn't know was that the game was rigged so that if they followed either Smiley's or Grumpy's strategy exclusively they stood no chance of winning at all, i.e., of getting 45 points. In

addition, the probability of winning with any other strategy while not impossible was extremely small. The purpose of rigging the game was to set the stage for the emergence of a third expert or character, Synthetic Sara.

Immediately after a subject finished playing his tenth matrix and saw that he lost the game, Synthetic Sara chimed in. Sara pointed out that Smiley and Grumpy were so locked-in to their strategies that they were not only unable to appreciate that they were both right part of the time but they were also unable to make use of all of the information actually "contained-in" the game situation. Sara pointed out that in situations where there were two or more strongly opposing views of a situation it was always possible to find a third view or position which was a synthesis of the original two positions.[4] Sara further pointed out that "ill-structured problems [26, 32]" (which games under uncertainty approach) were such that they required precisely this kind of approach. In order to get to the "heart" of an ill-structured problem one first had to examine how that problem appeared to at least two radically distinct points of view. In this sense though Grumpy and Smiley were both wrong (or incomplete), they were both still necessary; they were just not sufficient by themselves.

At this point the subject was asked to play another 10 matrices. This time Sara's play by play score was displayed along with Grumpy's and Smiley's. In addition, before each choice of a row, a subject now heard a three way debate between Grumpy, Smiley, and Sara. Each advised the

---

[4] Sara represented a modified Hurwicz game strategy [24]. For games under uncertainty, a Hurwicz strategy is a permissible synthetic solution to the dialectic between Smiley and Grumpy; i.e., a Hurwicz strategy is one way of escaping between the poles of Smiley's and Grumpy's positions while at the same time assimilating their positions.

subject what to do. This time the game was rigged in Sara's favor to illustrate "the power of dialectical thinking." A subject who followed Sara's strategy was guaranteed to win.

This completed the first exercise. At this point, the second exercise -- FREUD -- came into play. The basic purposes of FREUD were: (1) to heighten further the contrast and differences between dialectic and anti-dialectic thinking; and (2) to see if we could explicitly shift the attitudinal commitment [22] of subjects away from anti-dialectic thinking and towards dialectic thinking.

FREUD begins with an introductory statement designed to highlight the differences between dialectic and anti-dialectic thinking. For purposes of communication with subjects who may not be familiar with the specialized term "dialectic", dialectic thinking was termed Two-way Thinking and anti-dialectic was termed One-way Thinking:

> Hello, and welcome to FREUD [Favored Response Entertaining and Uncoupling Device]. This revolutionary device will analyze and probe into your inner beliefs, telling you what they are, and how you compare to other people who have played the BEAT THE COMPUTER game!...
>
> FREUD here. How are you today? The computer tells me that you have learned how to play the BEAT THE COMPUTER game. As you will recall, there were three characters each arguing for their own positions: Smiley and Grumpy said that there was only one way of winning the game--their respective ways! Synthetic Sara showed how it was always necessary to look at both sides of the issue, preferably in the form of an intense debate, so that the underlying emotions, beliefs, and opinions hidden in the arguments of the opposing sides could be uncovered.
>
> I will now summarize the positions of these so-called oneway and bothsides personalities, and then I will be asking you some questions to see how you feel about the subject.
>
> ONEWAY people believe that for any problem, there is one and only one "best" way to solve it. Every problem can best be

solved by finding and then applying the correct theory or method of solution. The best of these methods are mathematics, statistics, physics, logic, and so on, all of which have been shown to be true by the test of time. Science, likewise, by strict adherence to its rigorous method, usually is the best way to find answers for most problems. Even those problems which are extremely complex, and for which no clear-cut solution exists, can most always be broken down into a number of component parts which can then be independently solved. By setting out at the beginning with the goal of the "best" solution in mind, valuable resourses and time can usually be saved by the ONEWAY method.

BOTHSIDES people realize that the same data or "facts" can mean entirely different things, depending upon who looks at them. They further realize that for each expert, theory or law advanced to solve a problem, there can be found or proposed an equally valid counter-theory or counter-law which is radically opposite. Examples of such problems are everywhere: abortion, birth-control, penal reform, etc. For BOTHSIDES people, the best way to solve such a problem is to present the "facts" to proponents of each radically opposing theory, and witness the ensuing intense debate between them. That way, many of the hidden presuppositions, emotions, and beliefs can be uncovered and used in making decisions about the problem in question, by synthesizing the arguments of BOTHSIDES, a clearer path to solution can be found.

FREUD went on to say that by now the subject must have developed some attitudes towards each of these ways of thinking. FREUD promised to analyze (hence the name "FREUD") the subject's attitude towards these ways of thinking by analyzing the subject's response to a set of attitudinal items. The attitudinal items were presented in blocks of threes, for example:

ITEM 4: People who have to listen to both sides of an issue to make up their minds are usually more confused than people who take a strong stand on it.

ITEM 5: People who say that there are two sides on every issue are muddle-headed.

ITEM 6: On every issue there are always two opposing sides that are equally credible, but completely contradictory.

• • •

• • •

ITEM 16: It is best not to change your method of solution in the middle of a problem.

ITEM 17: The best experts are those who take a single, strong stand on an issue, and stick to it.

ITEM 18: There is never just one best answer to any problem.

After the presentation of each block of three items, the subject indicated how much he agreed or disagreed with each item in terms of a 7 point Likert scale. The computer then calculated the subject's total score for the three items and then came back to the subject with an immediate analysis of the responses. The computer indicated first how staunch advocates for the One-way and Two-way positions would have responded to the items, and then second, how close or far away the subject was from these pure or extreme response positions. The next step was the most critical.

The computer next came back with a critical response that either praised or attacked the subject's response depending upon how far the subject was from the pure Two-way position. Positions that were in accord with Two-way or dialectic thinking were praised and re-inforced; positions that were in opposition were attacked. The strength of attack or praise was varied according to the subject's degree of commitment to One-way or Two-way Thinking as measured by his degree of response to the items.[5]

A full and detailed analysis of the results of these exercises and experiments is the topic of another paper [37]. For the purposes of this paper, the most pertinent finding is that the subject responses (open-ended verbal protocols, scaled attitudinal scores) show a marked preference

---

[5] See Charles Kiesler's, The Psychology of Commitment [22], for the details of this procedure. See also [37].

and receptivity for information that is embedded within a story or character-laden context. By comparison exercises and experiments that were similar in nearly every respect (i.e., thematically) but which were lacking in the drama of the characters and the personal confrontation of FREUD failed to elicit the same positive reactions of the subjects towards the exercises themselves. Likewise they also failed to produce the same kinds of positive changes towards dialectic thinking that both FREUD and BEAT THE COMPUTER were able to effect. That is, as a result of both BEAT THE COMPUTER and FREUD, the subjects showed a statistically significant shift in their attitudes favorable to dialectic thinking.[6]

All 30 subjects responded on a 7 point Lickert type scale [strongly agree to strongly disagree] to a 14 attitudinal item questionnaire that pertained to the dialectic and the value of story-telling information systems. The questionnaire was administered prior to, during and after they partici-

---

[6] We do not suggest that a single set of experiments is sufficient to produce long-range behavioral and attitudinal changes. It's doubtful that any single set of exercises is sufficient to accomplish this. We do believe however that it is currently feasible to build information systems which not only present "data" but also effect changes in the user's attitudes towards the nature of the data. User attitudes can be modified within the context of information systems themselves. It is highly pertinent to note in this regard that during the course of play, subjects reacted intensely to both BEAT THE COMPUTER and FREUD: for example:

> "I guess I'm really a ONE-WAY type...I don't think I like Freud. He really gets to me."
>
> "This whole thing is fun. It really forces you to think about what you believe rather than just following Smiley, Grumpy, or all the rest of the characters."

If anything, MMIS raise the serious possibility of long-term attitudinal change through the fact that they can re-inforce and shape day-to-day attitudes. Needless to say, MMIS thus raise serious question of ethics. That is, the design of MMIS not only presents serious technical questions but it also raises serious ethical questions as well [9, 10]. MMIS make patently clear that "information" is not just an entity that possesses technical characteristics but that it possesses moral and ethical qualities as well.

pated in FREUD. A correlated t-test was performed on the means of each treatment scale. Based on a decision-rule of t_{29df} (.05) = 1.699 for a one-tail test, seven of the items show a significant shift between the pre and post tests, all of which were in the direction indicated by the dialectic theory. In particular the subjects strengthened their beliefs that (1) an intense argument between two strongly opposing sides of an issue is useful in clarifying points (t = 1.785), (2) good teachers make you unsure about your way of looking at things (t = 2.249), (3) for every issue there are always two equally credible but opposing and contradictory sides (t = 1.769), (4) vague assignments are usually more interesting than well-defined ones (t = 2.178), (5) paintings are as real and as good a means of representation as are photographs (t = 1.806), (6) non-scientists should be permitted to speak out on issues (t = 1.848) and (7) that poets are sometimes a better judge of mathematical problems than are mathematicians (t = 2.276). Six of the remaining items also showed shifts in the direction suggested by dialectical thinking although they were not significant at the .05 level. Despite these 13 positive shifts, subjects still generally confess that they "like to work on problems for which a well-defined straightforward answer exists" although the shift was not significant (t = 0.665). All in all, we concluded that the subjects left the game with a better appreciation for dialectic thinking and for anecdotal information than when they started.

There are some additional results which serve to strengthen our views on the impact of MMIS. The means of most of the scales reveal that an increased intensity in the subjects' attitudes was experienced "during" the FREUD exercise. There are several substantially significant shifts between

pre and "during FREUD" tests and/or between the "during FREUD" and post tests. This result, coupled with findings that subjects almost universally reported that they enjoyed the games, accepted the characters as "real", became emotionally involved in the games and the fact that they were able to strongly differentiate between the ideal types of oneway and bothsides thinking, suggest to us that even the rather simplistic MMIS or story-telling approach employed in BEAT THE COMPUTER and FREUD had a dramatic effect. The MMIS seemed to change the subjects' attitudes and beliefs as well as their store of data and thereby the information they gained from the data. These changes could eventually lead to new perspectives on problems and to new kinds of behavior.

Concluding Remarks

Tentative though they are, our preliminary experiments and theoretical reflections nevertheless suggest some guiding principles for the design of MMIS. They also suggest a clearer understanding of the differences between mythic (or personalistic) and non-mythic (or non-personalistic) information and finally, some promising courses of action for future research. The best place to begin is with the characteristic differences between mythic and non-mythic or scientific information. Table 1 lists some of the more important differences between the two.

By now, most of the entries in Table 1 should be self-explanatory and hence should require little comment. However, as a final brief commentary, consider the entries in row 5. Whereas scientific or non-personalistic information systems consider the elimination of redundancy a worthwhile goal if not one of the distinguishing characteristics of "scientific information," MMIS take just the opposite tack and look upon it as the "rhythm of life." [12]

Table 1: Some Characteristic Differences Between Mythic and Non-Mythic (or Scientific) Information

	Mythic or Personalistic Information		Scientific or Non-Personalistic Information
1.	highly partial, personal, interested [2, 12]	1.	impartial, impersonal, disinterested [2, 12]
2.	tends towards the specific; i.e., true only for the specific individual, organization [13, 14]; gathered or created for a specific purpose	2.	tends towards generalization; i.e., true in general for all persons, organizations [13, 14]; gathered or created to be used in many different environments
3.	heightens emotions, stirs passions, drama essential	3.	eliminates emotions and suppresses passions, drama inessential
4.	acceptance and use of bias [2, 12]	4.	elimination of bias [2, 12]
5.	highly repetitive, redundant	5.	elimination of redundancy and repetitiveness
6.	tends towards the implicit and the vague: the result of global intuitive processes, root metaphors, cultural motifs and images [12 ,13]	6.	tends towards the explicit and the precise: the result either of formal deductive processes or of inductive experiential inquiries [12,13]
7.	Feeling - toned [12, 26] Intuitive	7.	Thinking - toned [12,26] Sensation
8.	takes moral stands [18]	8.	amoral [18]
9.	is exoteric [10]	9.	is esoteric [10]

It is one of the fundamental characteristics of a good story, of a really basic tale, that it captures the spirit of its listeners and that it suffers little in retelling. Indeed, one of the fundamental characteristics of a good story is that its appeal lies precisely in its being told over and over again. It has as much appeal in the 100th telling as it had in the first because it plays over and over again on basic psychic needs that almost by definition will never be satisfied [15, 20, 21].

It is also one of the distinctive characteristics of basic stories or motifs that they will be recalled and invoked in times of special crisis, of crucial decision, or on special occasion. As Henry A. Murray has put it:

Note to editor:

imagent

is spelling in Murray.

I.M.

> ...A myth is a potent imagent. Among its various potencies or properties the following should probably be included. (a) The sensible mythic representation is peculiarly attractive in one way or another (vivid, impressive, spectacular, beautiful, enchanting, marvelous, mysterious), leaves a durable and recurrent imprint in many minds, and is often reproduced in different narrated, enacted, or portrayed versions (cynosural function). (b) It evokes empathy (corresponding feeling) or recipathy (reciprocal feeling) and finds positive affection (admiration, awe, adoration, fellow feeling, love, compassion) over a considerable period of time (affective function). (c) It elicits belief in its essential validity or authenticity, or faith in its occurrence in the future (cognitive function). (d) It guides conduct by portraying one or more basic human needs, their goal, the actions they propel, and the disastrous or successful outcome of these actions. If the aim or action of the hero is extravagant, vainglorious, reprehensible, or immoral and its outcome tragic, the story produces an empathic discharge and subsequent reduction of similarly unacceptable dispositions in susceptible receptors (cathartic and deterrent function). But if the aim and action of the hero or heroic group is admirable and the outcome happy (or maybe tragic), the story serves to initiate, orient, encourage, sustain, and ordinate comparable behavior (eductive function). This last is most applicable to exemplar myths, individual or social. (e) It produces all these effects to a sufficient degree in a large number of people--members of the same group, society, or religion--and thereby brings about wholehearted cooperative participation in the execution of an important endeavor or ceremony (consensual function).

> The potency of a myth is measurable, then, in terms of (i) the extent to which each of these functions is fulfilled (especially the eductive function), (ii) the number of people who are affected and possessed by it, and (iii) the duration of its influence. A superordinate mythology or myth is one that portrays the highest unifying goal or vision of an individual or of a collectivity, and as such is sacred to those of its adherents who are capable of reverence and dedication [35, pp. 215-216].

The foregoing leads us to the suggestion of some promising lines for future research. In one his papers, the distinguished social psychologist, Solomon E. Asch studied how people formed impressions of personality [3]. What Asch did was to feed persons relatively short lists of independent adjectives like "intelligent - skillful - industrious - warm - determined - practical - cautious." Asch then instructed his subjects to tell him in return what kind of person, if any, came to mind. In other words, Asch explicitly asked his subjects to form a whole picture from separate parts--in effect to form a short story about a person from small, random pieces of data. In no cases were his subjects unable to complete the task. The experiment seems to support the contention that people are indeed natural synthesizers and storytellers. They will literally invent a coordinating theme where one is not readily available or apparent. People seem to have an incessant need to boil or compact separate pieces of data down into a single coordinated image, or in our terms, a story.

The Asch experiment is interesting and important for other reasons as well. One of Asch's most interesting findings was that certain adjectives are more potent than others; i,e., certain adjectives were more important than others in influencing the final picture or story that emerged. For example, two of the most important pairs of adjectives in this regard are "warm-cold". Given two lists that are identical in

every respect save that one contains the adjective "warm" and the other contains the adjective "cold", the resultant stories will be almost completely determined by which of the two adjectives "warm" or "cold" it contains. Asch's technique would certainly seem capable of being extended to the study of lists composed not of single words but of short, compact stories. It would certainly seem to be a fruitful way of studying the potent imagent content of various stories, i.e., of comparing various myths and stories with respect to their power.

Most interesting of all, one can envision a whole series of studies that pertain directly to Management Science. Most MS experiments and studies are cognitively oriented. They either study the cognitive features of organizations or they orient the subjects of their experiments to the experiments themselves by means of cognitive rules or instructions. An interesting question is how the subjects in all of our simulated business games would perform if prior to play they were indoctrinated into the history of the simulated company, environment, or industry by means of stories that were designed to recount the significant history of the enterprise. If the subjects were heavily steeped in these stories or myths of the company or industry, would they recount and use them in times of crucial decision? Why haven't we done research in this crucial area? It has long been known that becoming part of any human community has meant learning the traditions and stories of that community. Are we so much a victim of our own image--our myths--of Management Science that we have in effect prevented us from studying ourselves [34]? Could it be that our image of what MS and MIS properly are has kept us from utilizing one of the richest, untapped sources for effecting change and understanding?

BIBLIOGRAPHY

1. Ackoff, Russell L., The Design of Social Research, University of Chicago Press, 1953.

2. Allen, Allen D., "Scientific Versus Judicial Fact Finding in the United States," IEEE Trans on Systems, Man, and Cybernetics, (September, 1972), pp. 548-550.

3. Asch, Solomon E., "Forming Impressions of Personality," Journal of Abnormal and Social Psychology, Vol. 41 (1946), pp. 258-290.

4. Brown, Norman O., Life Against Death: The Psychoanalytical Meaning of History, Vintage, New York, 1959.

5. Brown, Norman O., Love's Body, Random House, New York, 1966.

6. Campbell, Joseph, The Hero With A Thousand Faces, Meridan, New York, 1971.

7. Campbell, Joseph, Myths To Live By, the Viking Press, New York, 1972.

8. Campbell, Joseph, "Historical Development of Mythology", in Myth and Mythmaking, H. A. Murray, ed., George Braziller, New York, 1960.

9. Churchman, C. West, Challenge to Reason, McGraw-Hill, New York, 1968.

10. Churchman, C. West, The Design of Inquiring Systems, Basic Books, New York, 1971.

11. Cousins, Norman, "President Kennedy and the Russian Fable," Saturday Review, Jan. 9, 1971, p. 20-21.

12. Cowan, Thomas A., "Decision Theory in Law, Science and Technology," Science, Vol. 140 (June 7, 1963), pp. 1065-1075.

13. Cowan, Thomas A., "A Model for Jurisprudential Investigation," Internal Working Paper No. 60, Space Sciences Laboratory, Social Sciences Project, University of California, Berkeley, March, 1967.

14. Cowan, Thomas A., "Paradoxes of Science Administration," Science Vol. 177 (September 15, 1972), pp. 964-966.

15. de Laszlo, Violet S., Psyche and Symbol: A Selection from the Writings of C. G. Jung, Doubleday, New York, 1958.

16. Eliade, Mircea, Myth and Reality, Harper & Row, New York, 1963.

17. Harding, M. Esther, Woman's Mysteries, Ancient and Modern, A Psychological Interpretation of the Feminine Principle as Portrayed in Myth, Story, and Dreams, G. P. Putnam, New York, 1971.

18. Hudson, Liam, Contrary Imaginations, Schocken Books, New York, 1966.

19. Jacobi, Jolande, The Psychology of C. G. Jung, Yale University Press, 1962.

20. Jung, C. G., Psychological Types, Rutledge, London, 1923.

21. Jung, C. G., The Structure and Dynamics of the Psyche, Pantheon, New York, 1955.

22. Kiesler, Charles, The Psychology of Commitment, Academic Press, New York, 1971.

23. Kluckhohn, Clyde, "Recurrent Themes in Myth and Mythmaking," in Myth and Mythmaking, H. A. Murray, ed., George Braziller, New York, 1960, pp. 268-279.

24. Luce, R. Duncan, and Raiffa, Howard, Games and Decisions, Wiley, New York, 1958.

25. Mason, Richard O., "A Dialectical Approach to Strategic Planning," Management Science, Vol. 15, No. 8 (April, 1969), pp. B-403 - B-414.

26. Mason, Richard O., and Mitroff, Ian I., "A Program for Research on Management Information Systems," Management Science, Vol. 19, No. 5 (January, 1973), pp. 475-487.

27. Marcuse, Herbert, Eros and Civilization: A Philosophical Inquiry Into Freud, Vintage, New York, 1955.

28. May, Rollo, Love and Will, Norton, New York, 1969.

29. McLuhan, Marshall, The Gutenberg Galaxy, University of Toronto Press, Canada, 1965.

30. Mitroff, Ian I., "A Brunswik Lens Model of Dialectical Information Systems," Theory and Decision, 1974, forthcoming.

31. Mitroff, Ian I., "A Communication Model of Dialectical Inquiring Systems -- A Strategy for Strategic Planning," Management Science, Vol. 17, No. 10 (June, 1971), pp. B-634 - B-648.

32. Mitroff, Ian I., and Betz, Frederick, "Dialectical Decision Theory: A Meta-Theory of Decision-Making," Management Science, Vol. 19, No. 1 (September, 1972), pp. 11-24.

33. Mitroff, Ian I., Williams, James, and Rathswohl, Eugene, "Dialectical Inquiring Systems: A New Methodology for Information Science," Journal of American Society for Information Science, Vol. 23, No. 6 (Nov-Dec. 1972), pp. 365-378.

34. Mitroff, Ian I., The Subjective Side of Science: A Philosophical Enquiry Into the Psychology of the Apollo Moon Scientists, Elsevier, forthcoming.

35. Murray, Henry A., "Introduction to the Issue, 'Myth and Mythmaking'," in Myth and Mythmaking, H. A. Murray, ed., George Braziller, New York, 1960, pp. 211-222.

36. Murray, Henry A., ed., Myth and Mythmaking, George Braziller, New York, 1960.

37. Nelson, John, "Dialectic Information Systems: A Methodology for Planning and Decision Making," Ph.D. Dissertation, University of Pittsburgh, Pittsburgh, Pa. June, 1973.

38. Raglan, Lord, The Hero, A Study in Tradition, Myth, and Drama, Vintage Books, New York, 1956.

39. Roszak, Theodore, The Making of a Counter Culture, Doubleday, New York, 1969